



# 45<sup>th</sup> Annual NDIA Fuze Conference



## Mechanical Packaging of the EX 433 Proximity Fuze for Submunitions

18 April 2001

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**NSWCDD G34**

**Fuze Branch**

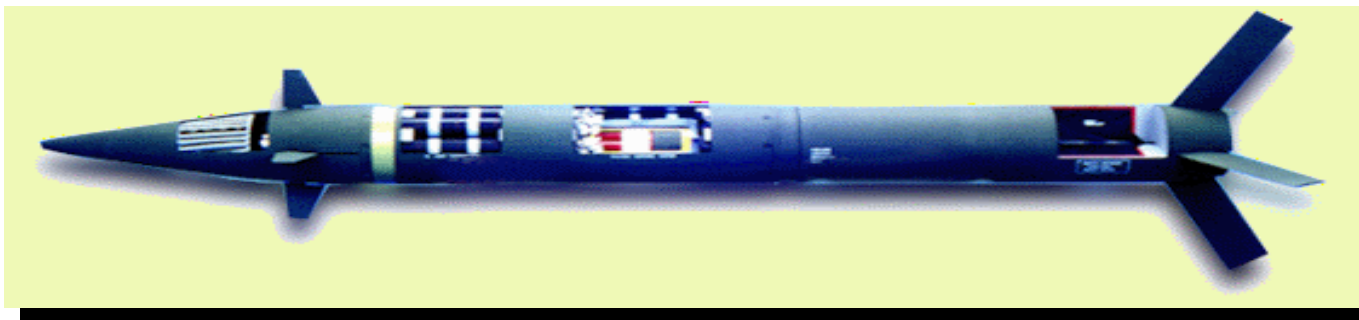


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MK 45 MOD 4  
Gun Mount

EX 3 Submunition  
w/ EX 433 Proximity  
Fuze



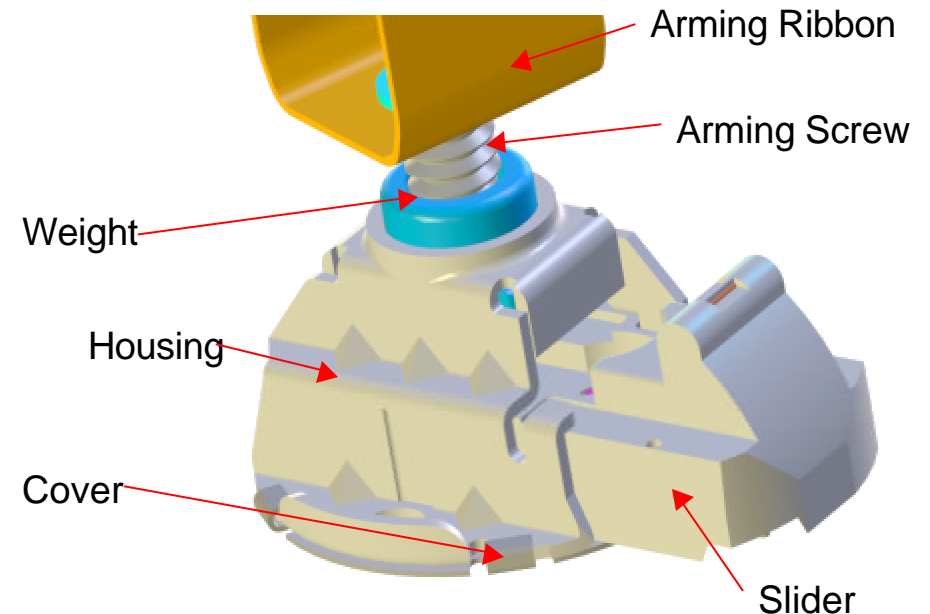
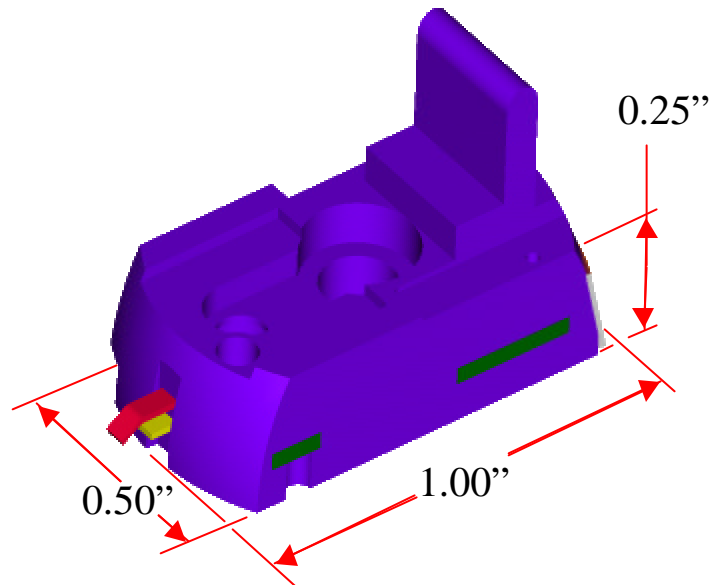
ERGM: Extended Range Guided Munition





# M80 PIP Objective

- To package the electronics and mechanical components of the Proximity Fuze in the shape and size of the current M234 SD Slider for the M80 Submunition for ERGM
  - One-for-One replacement of current Slider



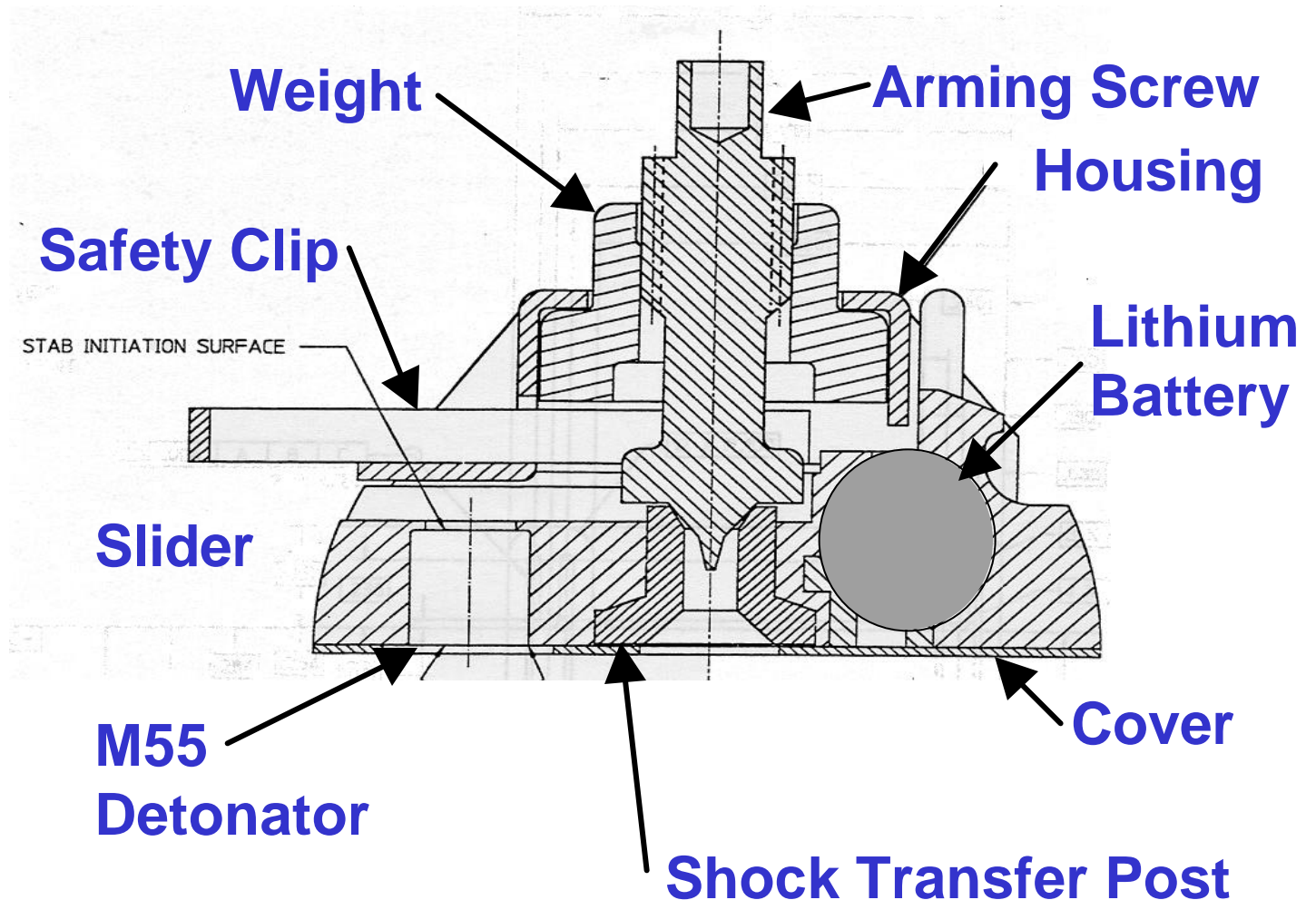




# M234 Self-Destruct Fuze



M80 w/  
M234



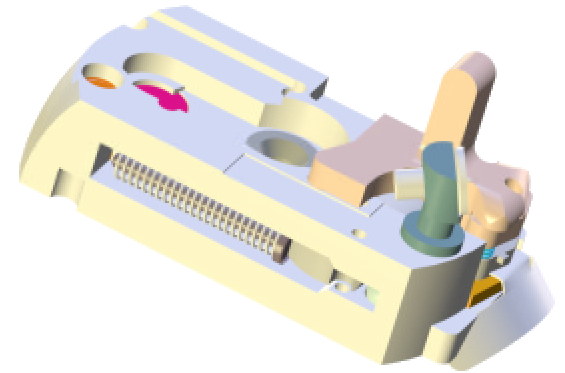
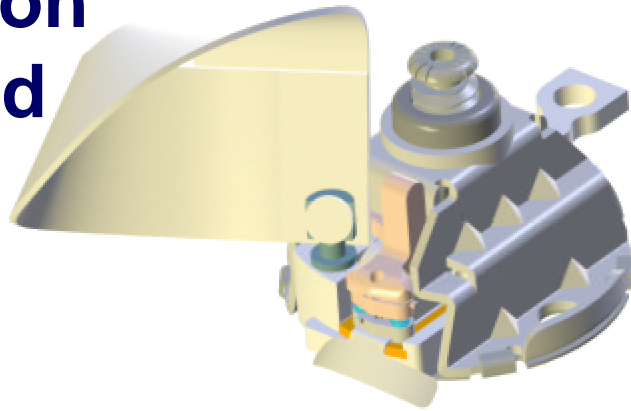


# Parts removed from M234

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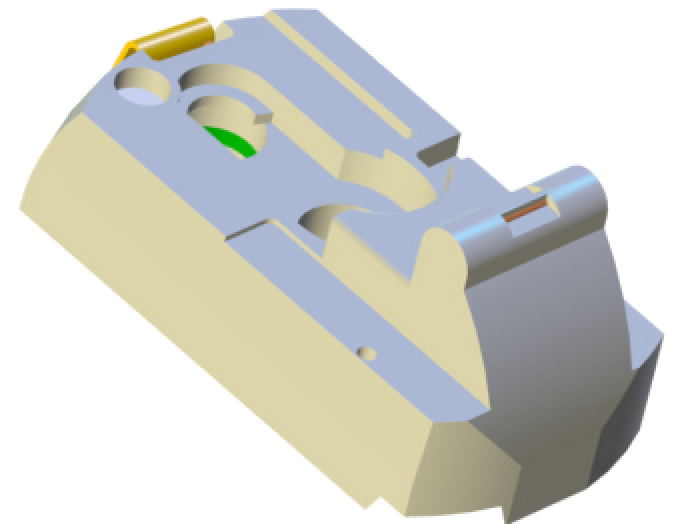
- **Battery Activation System removed**

- Spring
- Lever (hammer)
- Pivot
- Spiral Ribbon Assy
- Ball



- **Shunt and Safety Pin removed**

- **Battery Cover removed**





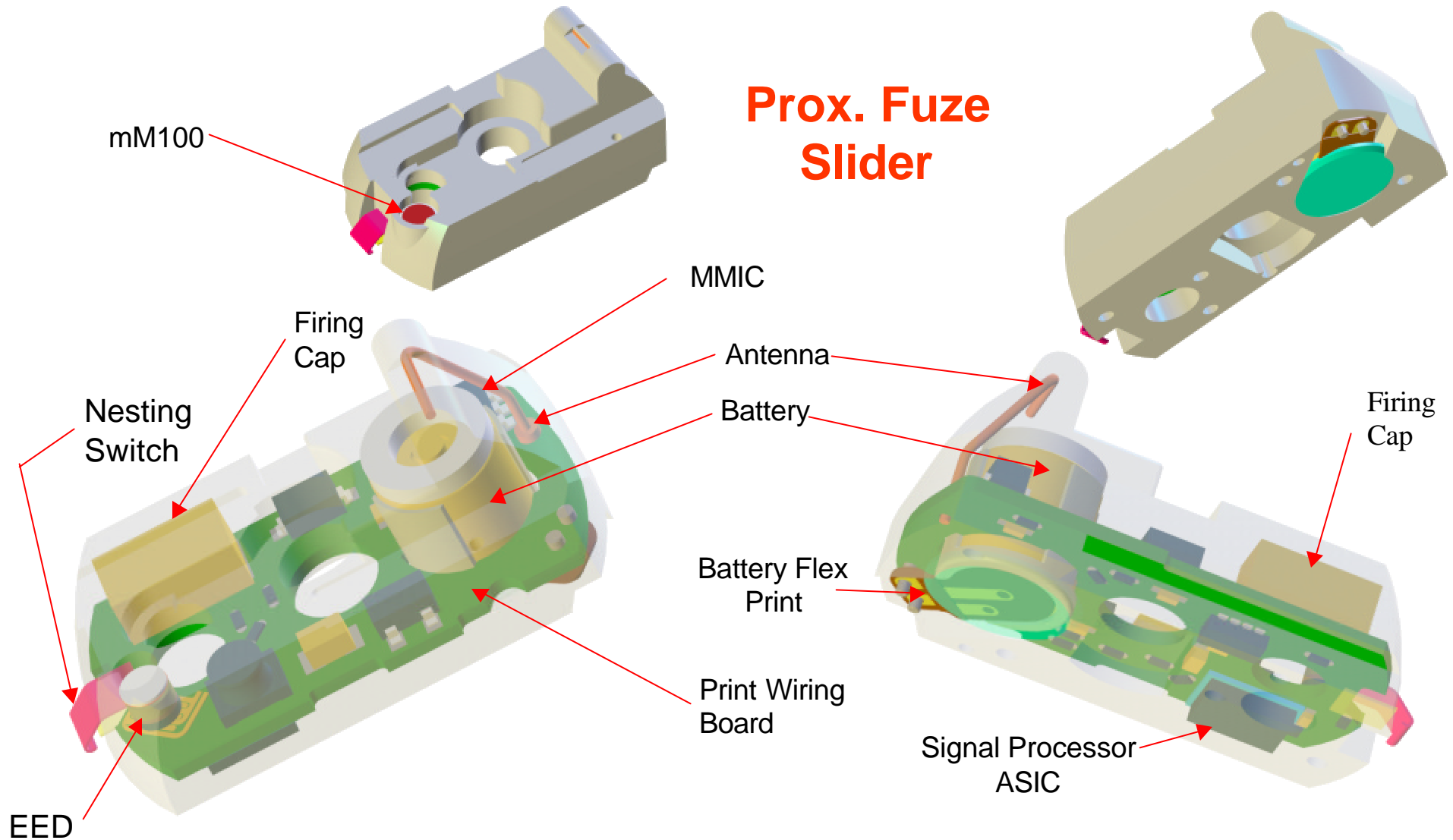
# Functions


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- **Primary Mechanical Safety And Arming Features of the M234 SD Fuze Retained**
  - Impact Firing System is now the backup
- **Prox Fuze electronics will use two timers**
  - Separation Timer
    - Ensures proper event sequence
      - Battery activation and unnesting
  - Self-Destruct Timer
    - Provides the current cleanup capabilities of M234 SDF
      - Self-Neutralization or Self-Destruct



# Major Components Layout





# **Battery**

# **Nesting Switch**

# **mM100**



# Battery

**Nesting Switch**

**mM100**



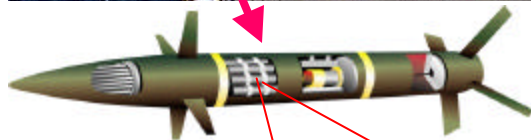


MK45 MOD4

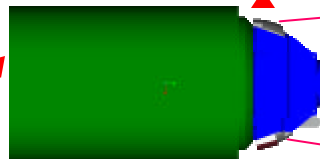
Direction of Flight  
←



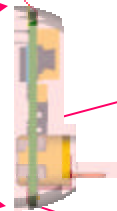
ERGM



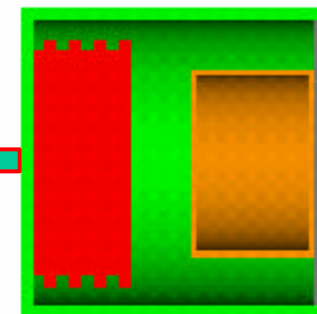
EX-3



Slider



Prox. Fuze Battery



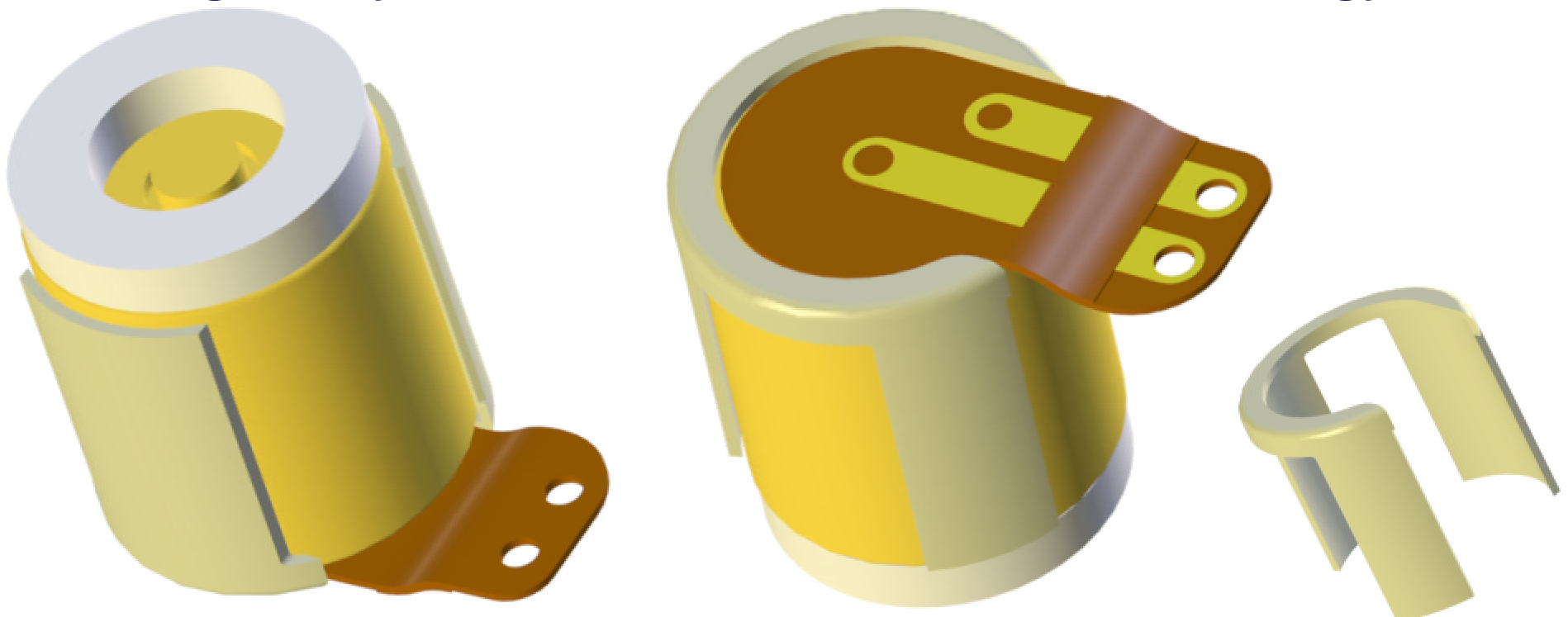
Force

Battery slides during  
Set Back

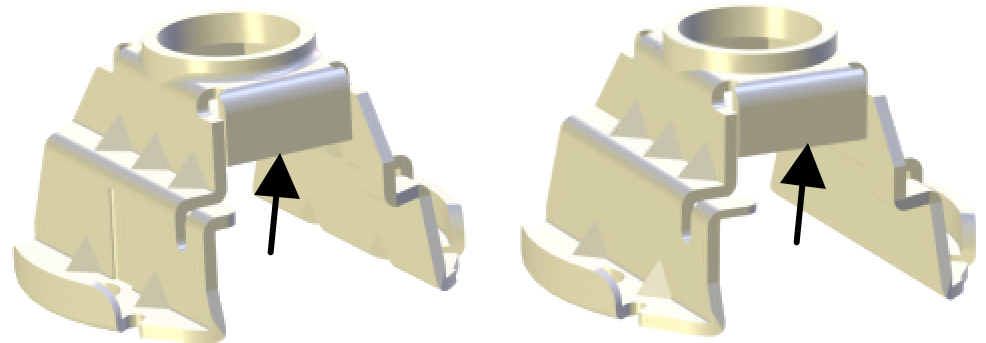
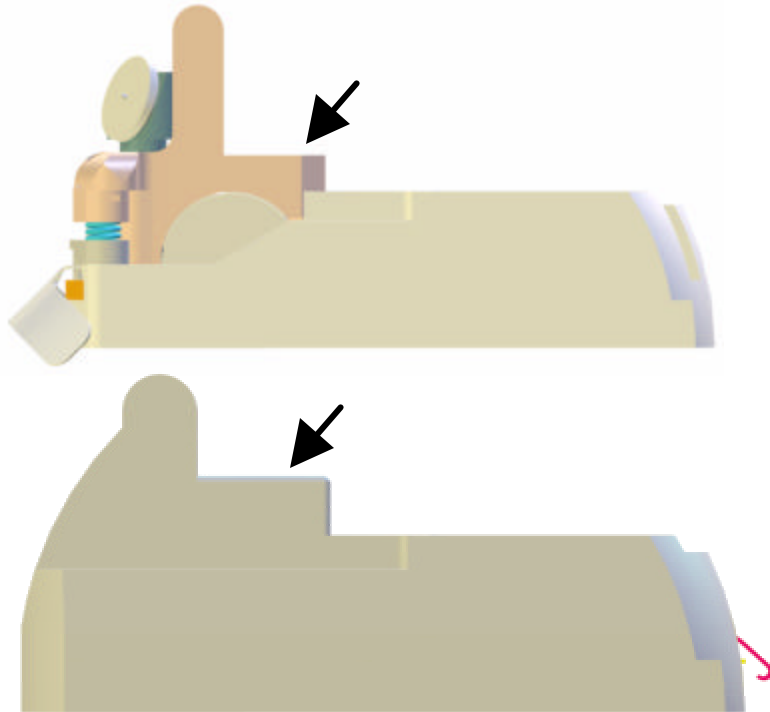


# Battery

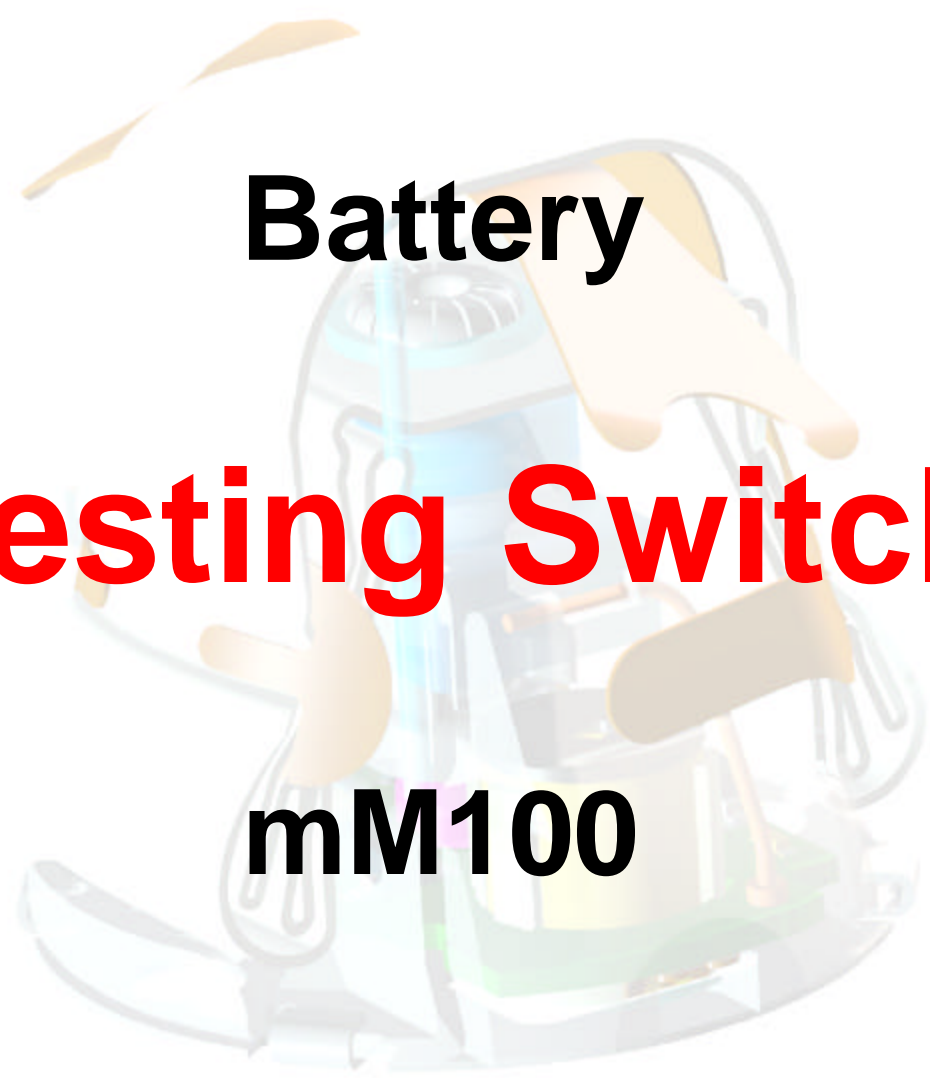
- Requires a small nub to be molded into the plastic or a feature on the Battery
- Flex Print connection to Print Wiring Board
- Weight may be added to increase activation energy



# Taller Slider



- Tab on front of M234 Housing has been shortened
- Slider height increased to allow maximum room for Battery



# Battery

# Nesting Switch

# mM100





# Nesting Switch

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- **Description**

- Replaces the function of the Shunt on the M234 SDF
  - Self-Destruct timer
  - Room needed for Antenna, Battery, & electronic components
- Prox. Fuze Sensor off line until submunitions dispensed
  - Reduces power consumption until M80's dispensed
- Closed while the submunitions are nested in the payload

- **Allows Self-Destruct time to be reduced from 3 minutes to 60 seconds - desired by Marines**



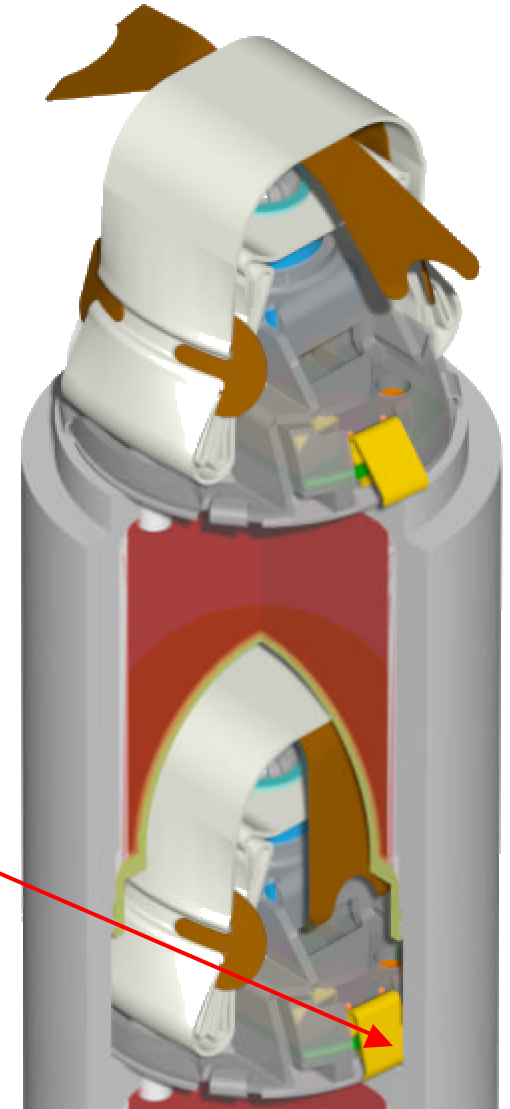
# Nesting Switch

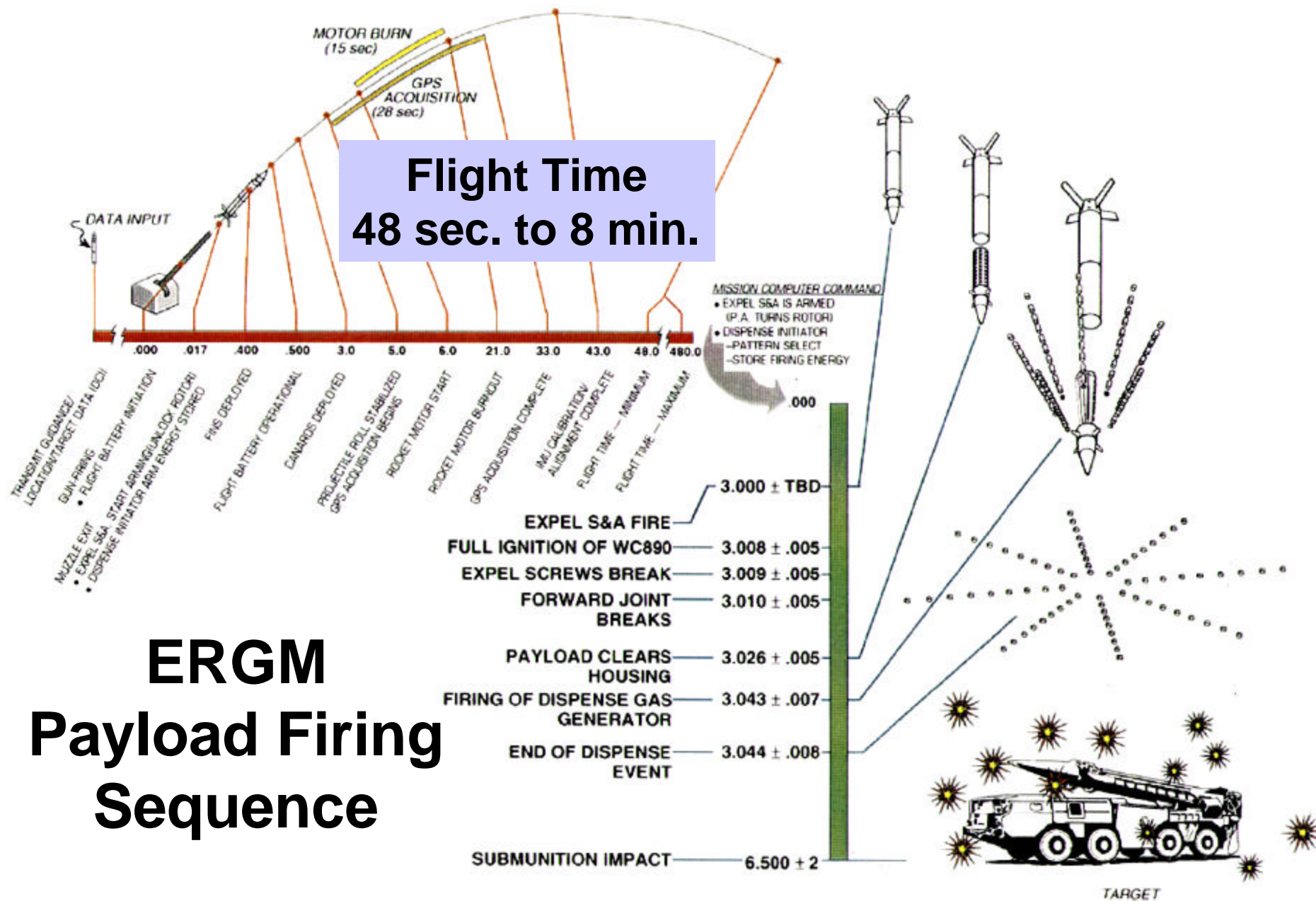
## Nesting of grenades closes switch contacts

- **Fault Tree Analysis**
  - Shows the use of the Nesting Switch to be as safe as the Shunt
- **Safety Analysis**
  - Lone Star Army Ammunition Plant Concurs

**Nested Submunitions**

Nesting Switch compressed by stacked submunition







# Accident Scenario

- **Assumption:**

- The accident in some way has activated the Battery and the electronics are powered up
  - Drop, Accidental Expulsion

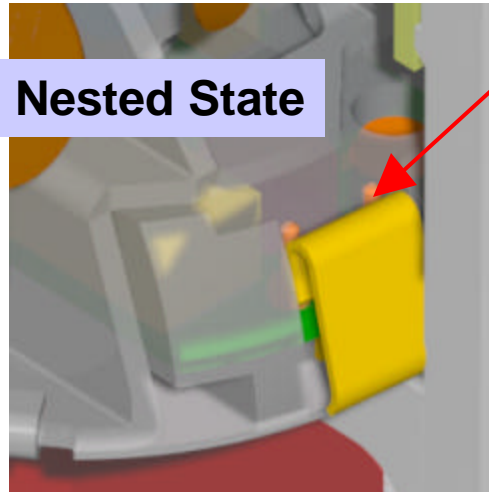
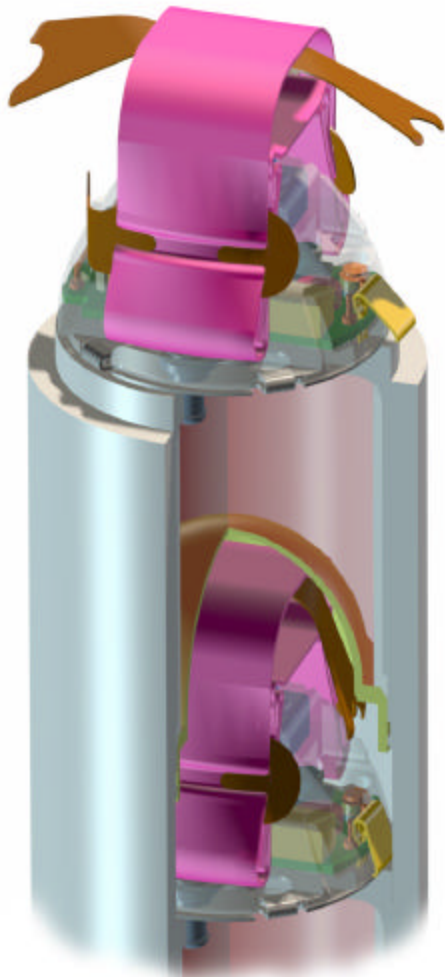
- **Safety Logic:**

- The Signal Processor IC will compare the Nesting Switch condition and Separation Timer (Battery activation time)
  - If the Nesting Switch is opened within 30 seconds of Battery activation the Prox. Fuze will safe itself
  - If the Nesting Switch is closed in the nested state and the Battery has been activated for 10 minutes the Prox. Fuze will safe itself

**\* Point Detonate Safety Issue still a concern**

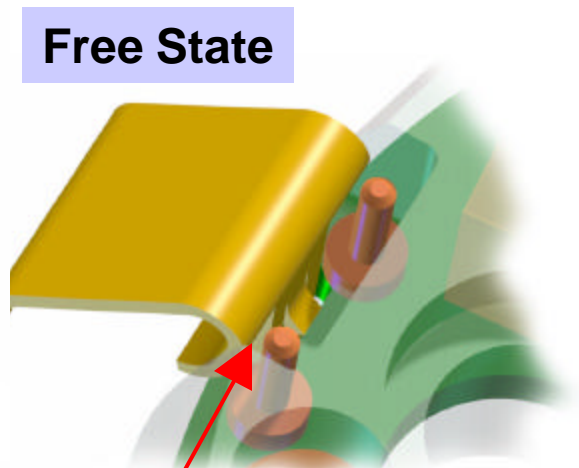


# Nesting Switch Concept #1



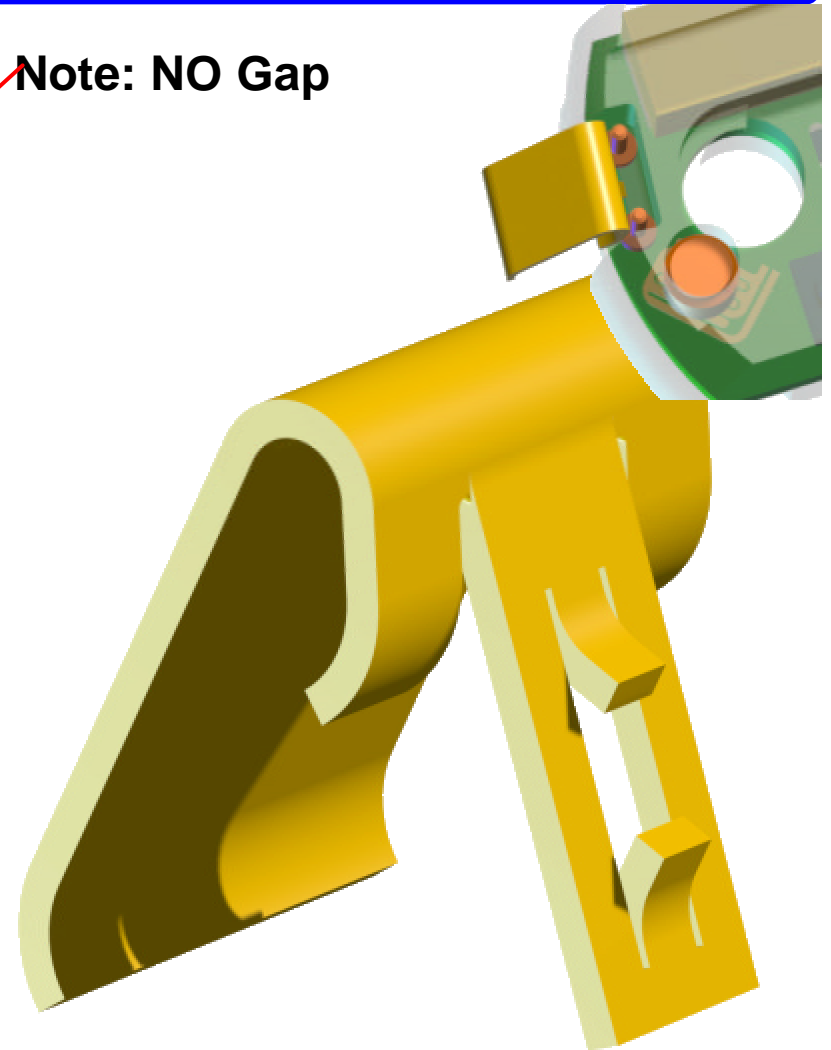
Nested State

Note: NO Gap



Free State

Note: Gap

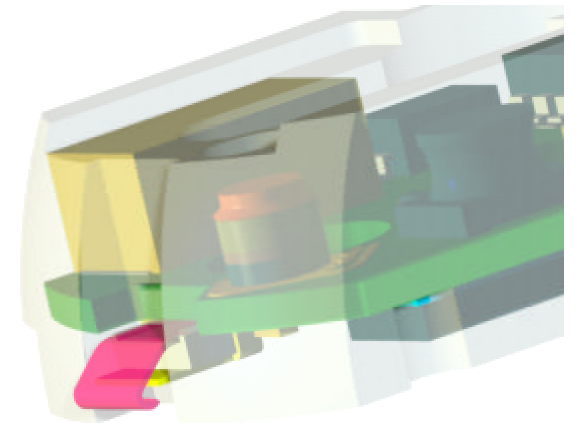
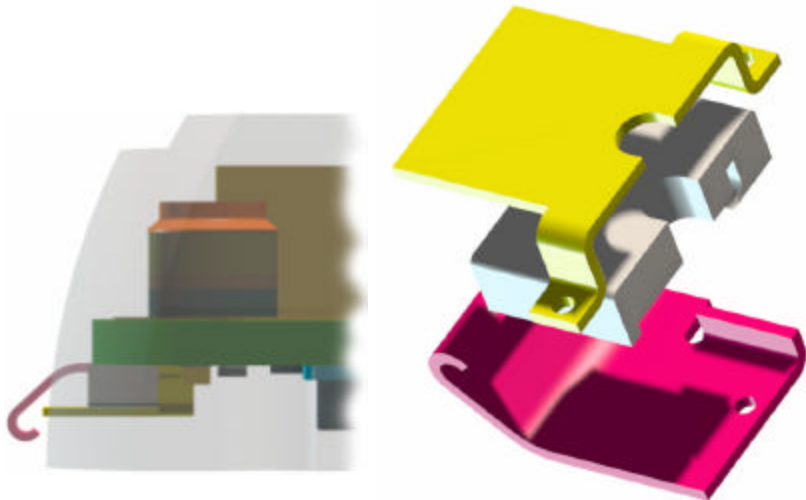
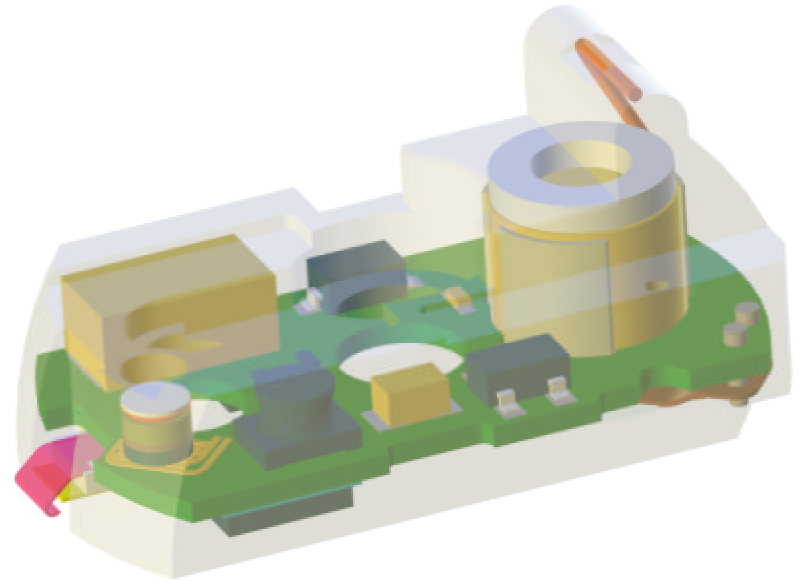







# Nesting Switch Concept #2

- The PWB is molded to form the Slider
- The two Nest Switch leaves are molded together
- Then soldered to the Slider Sub-Assembly



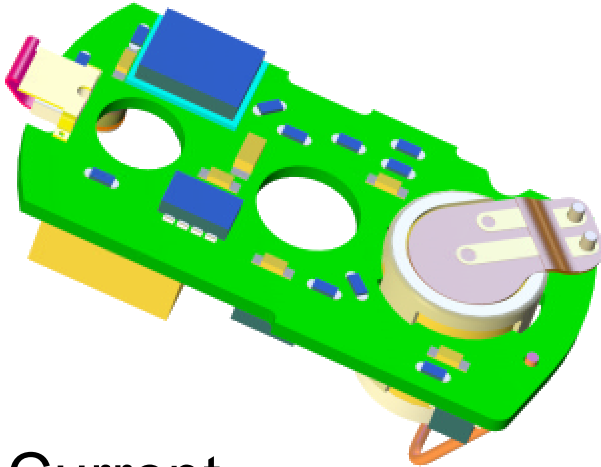


# Battery

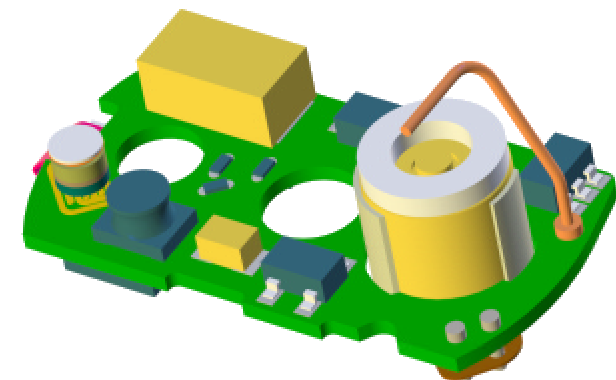
# Nesting Switch

# mM100

# EED vs. mM100

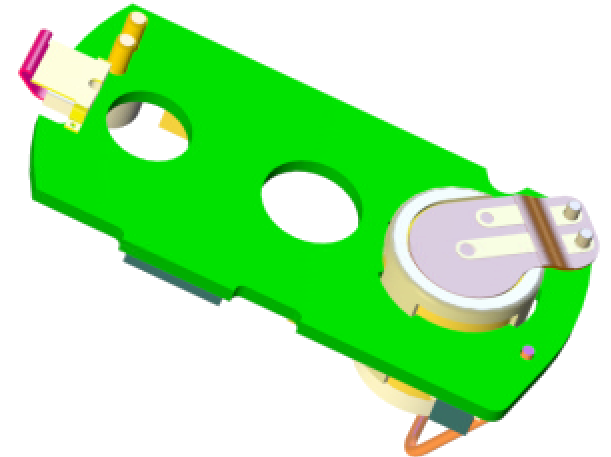


Current  
M234 EED  
Version

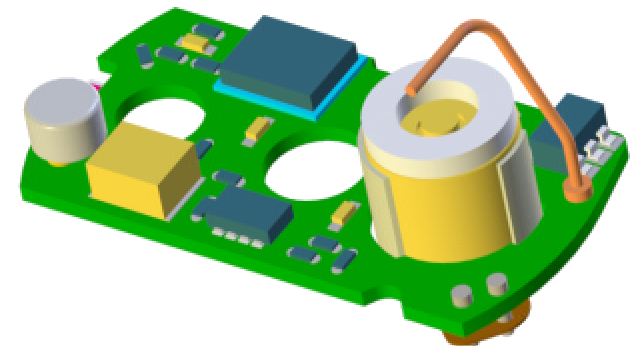


- mM100 design offers
- Reduced component count
  - Reduced component sizes
  - Reduced testing
  - Single sided PWB
  - Reduced PWB costs
  - Increase reliability

- No impact on battery
- Either Nesting Switch concept



mM100  
Version





# Summary



- **Teamwork**

- Government and Contractor
- Battery, Electronics, and Mechanical Packaging Teams

